Light and Lighting

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Shop Display Lighting

LONG ago it was said that we are a nation of "shopkeepers." But whether, taking "shopkeepers" either literally or as meaning "traders," we are now better so characterised than are some other peoples is doubtful. Nevertheless, British shopkeepers, in common with their confrères in other countries, are anxious to display their wares seductively; and they are becoming more and more conscious that art-full lighting—rather than mere lavish illumination—is of the essence of sales-promoting displays. Speaking generally, however, art in lighting shop displays is still not of a sufficiently high order. It is disappointing to us that a new ban on shop-window lighting should have been imposed at the very time when this number of our Journal—featuring the subject of shop-window lighting—goes to press. Doubtless, shopkeepers are even more disappointed at this unfortunate turn of events, but good ideas are always worth having even if they cannot be acted upon immediately, and we hope it will not be long before those presented in our pages can be widely utilized.

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Notes and News

Trotter-Paterson Memorial Lecturer

The first Trotter-Paterson Memorial Lecture on January 17, when Dr. J. W. T. Walsh dealt with the early years of illuminating engineering in Great Britain, attracted an audience which included many well-known people in the world of science. As indicated in the title, the lecture dealt with the growth of the illuminating engineering movement in this country, and, in addition to honouring the memory of Mr. A. P. Trotter and Sir Clifford Paterson, the lecture has, no doubt, drawn the attention of many to the existence and work of the I.E.S.

The lecturer covered the period from 1892 to the years immediately following the first World War, and described the work of the pioneers in the field and traced the influence of the I.E.S. in bringing about a better appreciation of the importance of a specialised study of lighting problems. There are not now many people who are familiar with the early days of the I.E.S., and Dr. Walsh's treatment of this period is of considerable interest.

Dr. Walsh said that illuminating engineering may be considered as having begun when attention was consciously paid to the lighting effects produced by the lamps employed and deliberate attempts were made to achieve a preconceived result. The pioneer in this field was Benjamin Thompson, Count Rumford, whose treatise "On the Management of Light in Illumination" must be the first book on illuminating engineering ever published. It may therefore be claimed that the first illuminating engineer was an Englishman. The illuminating engineering movement probably started in 1892 when A. P. Trotter read his classic paper, "The Distribution and Measurement of Illumination," before the Institution of Civil Engineers, though long before he wrote this paper Trotter had been interested in illumination matters.

After Trotter's paper of 1892 interest in the subject of illumination spread very gradually, at first only among engineers, and attracted the attention of such men as Silvanus Thompson. In 1905 Leon Gaster was impressing upon both technicians and laity the importance and the possibilities of a more specialised study of lighting problems. In 1908 he founded "The Illuminating Engineer" (the forerunner of LIGHT AND LIGHTING). Soon after this proposals for the formation of an illuminating engineering society in this country were put forward, and whilst keen support was forthcoming so was strong opposition. There is no doubt that the fear that commercial rivalries might wreck any society devoted to the study of illumination was ever present in

Next I.E.S. Meeting In London

The next I.E.S. Sessional meeting in London will be held at the Lighting Service Bureau, 2, Savoyhill, W.C.2, on Tuesday, February 13, at 6 p.m.

At this meeting a paper entitled "The Extension of the Gas Arc Condition" will be presented by Mr. H. W. Cumming. This paper reports continuation of the work described a year or two ago, by Dr. Aldington, and describes a new form of xenon lamp rated at 1 kw. The applications of several types of gas arc discharges will be indicated.

the minds of those most keen on the project, and Gaster insisted that "what we want you to tell us is what you *can* do and not what the other fellow *can't* do."

In 1909 the decision was taken to form the I.E.S., and in announcing this Gaster said: "We naturally hope that in time to come, when the subject of illumination has been thrashed out in detail to a far greater extent than at present, 'expert illuminating engineers' will have a professional existence and will, even though few in number, be entitled to claim the distinction that the name implies." In view of the developments which have taken place in the Society during the last two or three years this statement is of particular interest.

The first president of the Society was Prof. Silvanus P. Thompson. The honorary secretary was naturally Leon Gaster, and J. S. Dow, who had been associated with Gaster from the time of the inception of the journal, also took a full share in the work of running the Society. Thus Dow began a long period of service to the I.E.S. which only terminated with his death in 1948.

The year 1912 saw a very important advance in the struggle for official recognition of the importance of good illumination in daily life when the Home Secretary set up a Departmental Committee "To inquire and report as to the conditions necessary for the adequate and suitable lighting (natural and artificial) of factories and workshops, having regard to the nature of the work carried on, the protection of the eyesight of the persons employed and the various forms of illumination." There is no doubt that the committee's report, although it had no legislative force, helped very greatly to bring about a steady improvement in the lighting conditions in factories during the years between the wars.

Trotter became president of the I.E.S. in 1917 and he held that office until the end of the 1919-20 session when he was succeeded by Parsons. In 1920 Trotter retired to Teffont and Paterson was now the acknowledged leader in the illuminating engineering world. This position he owed to a combination of causes. He had built up the photometric section at the National Physical Laboratory, and during the 15 years that he was with Glazebrook there he had done a great deal of pioneer work, much of it with B. P. Dudding, on photometric standards and on various problems of light measurement. When he left the N.P.L. early in 1919 he began to build up a vast industrial research laboratory in which illumination research received a good deal of attention. He had been honorary secretary of the International Commission on Illumination ever since its formation in 1913, and remained honorary secretary with only one break between 1928 and 1931, when he was president, until the conclusion of its latest meeting in 1948.

The years immediately following the first World War may well be regarded as marking the end of the pioneering period and the beginning of the modern era in illuminating engineering. The fundamental principles had been established, and as new and improved sources of light appeared they were absorbed, usually quite naturally, into the main stream of development. This brief historical survey began with Trotter the pioneer, and concluded with Paterson as the accepted leader in illumination, for between these two span well over half a century of illuminating engineering in this country.

A vote of thanks to Dr. Walsh for his lecture was proposed by Prof. J. T. MacGregor-Morris and seconded by Dr. B. P. Dudding, both of whom were associates of both Trotter and Paterson, and who have spent many years in the field of illuminating engineering. We would like to add our congratulations to Dr. Walsh on his lecture and to the Society for its excellent choice in the first Trotter-Paterson Lecturer. It has been possible in these notes to deal only briefly with parts of the lecture, the whole of which will be published in the I.E.S. Transactions in due course.

The display windows of this Bond Street jeweller's shop are lighted by means of tungsten lamps concealed in a hanging canopy.

Window Display Lighting

By E. E. LUCKING*

The author has had wide experience in the design of shop-window displays and here deals with lighting which is only one of his tools.

Display lighting of shops and stores has developed somewhat slowly and unimaginatively since the odd exposed pendant fitting superseded gas lighting. Reflectors—tin or enamel, plain or pearl, opaque or silvered—have played their part in various shapes and forms—round, square, troughed or cunningly parabolic. The most common type of installation of the 1920s and 1930s was the transom row of mirrored reflectors usually concealed by a pelmet. The more ambitious added a flood or a few spot lamps; the adventurous used coloured gelatines.

In the main, light sources clung to the ceiling, on the assumption that daylight comes from above. Thus the light which was hindered by the window-dresser's bugbear, "top dressing," was considerably diminished at eye level, and that which eventually percolated to the window base was inadequate.

The removal or outmoding of "top dressing"—now almost, but not quite, forgotten—has given us an overlighted and empty upper-third to many displays. The really important areas are still ineffectually lighted. This stuffing of lamps to capacity brought further troubles. The intense heat was disastrous, particularly to cut leather-work, handbags and the like, and it precluded the use of natural flowers and plants as well as causing great discomfort to those unfortunates who were obliged to work in these airless, oven-like cavities. Wax mannequins have been known to wilt from the heat of a nearby "spot" combined with the overall heat. Furthermore, with such concentration of heat, the circulation of air currents gathered an adherence of dust and grime.

When the ban on shop window lighting was unexpectedly lifted, most shops were utterly unprepared. In many shops the entire lighting system had been wrecked by the bombing or else it needed complete overhaul and rewiring after ten years of neglect. Considerable confusion of thought followed—whether just to renew the previous type of installation or to embark upon something more adventurous. Fluorescent tubes proved a blessing and a bane. With power consumption to be kept at a minimum, they offered an attractive proposition. Though more expensive to install, one required considerably fewer points and gained in the amount of light output with a handsome saving of current. This new type of lighting, however, brought much controversy and demanded a renewed appraisal of colour values. The public and store executives alike had, for many long years, been able to judge colours and textures under artificial light and subconsciously to adjust them in their mind's eye to their daylight values. Display-men had been able to "dress" a window in daylight, or a mixture of natural and artificial light, with a certainty of what would happen as daylight waned and electric light came into its own. Unhappily, most fluorescent lamps vivified certain colours to a disturbing brilliance reminiscent of colour photography and coloured cinema films.

Whilst all previous forms of artificial light, candle, oil, gas, or electric, had dimmed and mellowed, softened and flattered, here was a light source which lifted us from subcolour consciousness and gave us an abnormal rendering of hue. We had become accustomed to the sub-colourings; in our own homes we described them as cosy, warm or intimate when assessing interior decoration, though most blues became depressing. With fluorescent lighting, the conception of the intimate, cosy or mellow was shattered. Yellow, blues with a red content, certain blue-greens, and scarlet leapt forward at one to an alarming degree.

The crux of the whole thing is our assessment of natural daylight. Surely the answer

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is to be found in the dazzling clarity of morning light during April and May. Sunlight through the rain-washed atmosphere at that season gives a totally different and truer colour rendering than through the hazy, humid heat of August, or the mellowed low-angled sunlight of Autumn. This refreshment of colour values can readily be tested by a studio north light, not direct sunlight.

Perhaps there is an analogy here and fluorescent lighting skilfully used can suggest spring and youthful freshness, liveliness and growth; our accustomed installations can do the rest and convey warmth, maturity and relaxation. The more macabre effects should perhaps remain the art of the theatre and should not be brought into the world of the retailer.

With, however, the more recent advances in the development of coloured fluorescent tubes, it is possible to obtain all these effects with a maximum amount of light and a minimum amount of heat. The old method of using coloured gelatine screens to obtain certain colours wasted up to 75 per cent. of the light. To-day, we see quite an amount of experimentation; many still adhering to the pre-war conception of basic transom row with, maybe, an odd spot or flood; some relying on internally silvered mirrored spot-lamps and giving a somewhat unbalanced and unattractive patchiness; a third method has produced the completely louvred ceiling of fluorescent tubes. This brilliantly lighted ceiling tends to attract attention above the display, even above the already overlighted and vacant "upper third."

Imaginative lighting of shops and stores is ready to come into its own, but, unhappily, the restrictions necessitated by the control of electric power during factory hours do not encourage its advancement. Few of us have yet the resources to acquire any real display lighting technique. Far too many managements, thinking that business finishes with the shutting of their doors and underrating the value of a well-lighted frontage after closing time, will not consider an intelligent installation merely for evening and week-end use.

At present, we have two major schools of thought. Those who are determined at all costs to gain the maximum amount of attention will blaze exposed fluorescent tubes, even to outlining the architectural horrors at the rear of the displays and throwing the merchandise into silhouette. The other extreme to this method of complete dazzle is the apparent practice of "black-magic." Stygian gloom and a few coloured spot-lamps may be tantalising at a distance, but they are extremely annoying and disadvantageous to those who may take the trouble to stop a car or cross the road to window shop. If it is agreed that the aim of display is to sell, then, surely, the merchandise offered for sale should be distinguishable!

There is a middle and more logical course whereby a soft and general lighting may be enlivened by the use of dramatic emphasis. It should be remembered that overlighting of merchandise, as with humans, can be very revealing. Faulty surface textures are revealed, bubbling seams and careless finish magnified. Overlighting can give a harsh, staccato and cheapening effect, while overlighting from the top by louvre-all fluorescence brings a curious flatness.

Those of us who wish to install an all-purpose set-up can learn much from the theatre and the photographer's studio. In neither of these instances is the light source restricted to the top, or to an equivalent of the transom row. Top, sides, and base lighting blend to give the softening effect and kindliness of all-pervading natural daylight. By using a complete surround of fluorescent tubes on the inner frame of the window, with at least two to three tubes at either side and a greater banking at the top, with each tube individually switched, one may have controlled over-all lighting. Interest may be focused by the use of internally silvered spots, and the dark areas will, at the same time, disappear.

Unfortunately, in the past, architects and store planners have not provided for the using of such a battery, so we may be forced to reduce our glass area by using proscenium arches and the like.

There is a good deal of research to be done to find the right quality and quantity of light for specific things. Fibres of silk, wool, and cotton each react differently according to the weave. Rayon and nylon demand further subtleties of treatment. The lighting of glass-ware is still a hazard, and the colour and grain of fine woods can be readily debased, especially the patina of antique furniture. Silver and jewels, too, pose quite a problem.

In the past we have been too casual and too ready to accept a standard treatment for each and every window, irrespective of purpose. To-day we can foresee a vital development and art in shop window lighting which, if handled intelligently and not as a toy, may prove 1951 to be a Festival of Enlightenment.

Lighting the Small Specialist Shop

By R. L. C. TATE * F.R.S.A.

Though interest in shop lighting has increased in recent years, the small shop has not been given the same attention as the large departmental store, even though they are far more numerous. The lighting problem is distinct and calls for a different approach.

In spite of the large and constantly increasing number of multiple and chain stores, small shops, frequently specialising in a particular line of merchandise, still form the bulk of retail businesses in this country. The proprietors of these small firms have not always been alive to the advantages of good lighting, but they are becoming increasingly light-conscious and, particularly in the last year, a number of excellently designed installations have been put into this class of shop. Small shopkeepers tend to go to the local electrical contractor or electricity board showrooms rather than to shopfitters or the larger firms, and there is no doubt that a live man can find a great deal of business among the shopkeepers in his vicinity. It is therefore worth while to consider the special problems that are involved in this class of work when compared with those encountered in the larger stores.

Since both space and capital are likely to be limited it is essential to aim at a scheme which combines economy of installation with the most skilful use of light to direct customers' attention on to the goods displayed and to promote sales. In a small shop where every inch of wall and floor space is valuable, the lighting must be designed to suit the goods displayed. It is not enough, as in a large multiple store, to provide a high level of illumination over the whole area; dramatic presentation of the goods is both easier

* Lighting Service Bureau

Fig. 1. A small glass and china shop before relighting. Note how goods displayed in the window are silhouetted against the interior lighting, and the muddled effect caused by glare and shadows. Compare it with the new lighting (see Fig. 2).

Fig. 2. Conventional lighting of this window was unsuitable for the crowded display of crockery and glass. Short fluorescent lamps mounted below the shelf and screened by a small pelmet bring the display into sharp relief against the unlighted interior. A 150w. filament spot-lamp is directed on to the glass display in the centre.

and more effective in the intimate atmosphere of the smaller shop.

The shop-window is likely to provide special problems. The shopkeeper or manager will dress it himself, and will probably tend to put rather more goods into the window than would a window-dresser in a large store. Often a conventional treatment with lamps mounted behind pelmets is less effective than a scheme where the light comes from the sides or base of the window. Where a very large number of small objects are displayed on shelves which come close to the glass, vertically mounted fluorescent lamps are frequently used. It is seldom that one sees them adequately screened, though this is essential if the goods are to be effectively displayed and glare avoided. Ironmongers, cycle dealers, and electrical contractors, who often display a large number of small objects on the floor of the window, may find that a very effective method of lighting them is to have a bank of adequately screened lamps at the foot of the window, possibly supplemented by vertically mounted lamps. This technique is particularly effective where fairly large objects are hung in the window, which would prevent the light from lamps mounted in the normal position from reaching the lower parts of the display. Newsagents frequently mount a row of fluorescent lamps between two hanging tiers of magazines or periodicals, so that the outer tier acts as a baffle to conceal the lamps from view.

Mention must be made of the open-back window, already very popular in the United States and spreading rapidly in this country. This technique is particularly suited to the small specialist shop—it is indeed very doubtful whether it is of value in any other type of establishment. Since the window-backing no longer obstructs the view into the shop, display in the window itself is reduced to a minimum, an important consideration when the shopkeeper is his own window-dresser. In addition, it is claimed that throwing the shop open to view from the street removes the psychological barrier between window-gazers and customers inside the shop; in effect, the shop becomes something like an exhibition stand, and the glass merely serves as a screen to keep out the weather.

Here is a great opportunity for the lighting engineer. When the interior of the shop is seen from the street it must bear a close relationship to the window, and a bad or even a merely conventional lighting installation can completely mar the effect. On the other hand, skilful use of lighting can lure customers into the shop, and is undoubtedly the most important single feature in its decoration. An aspect of the open-back window which sometimes gets neglected is that the shop forms the background to the window display: a muddled design or glaring lighting fitting can completely ruin it.

An idea which seems likely to catch on is to have a large lighted showcase on the back wall of the shop facing the window. At night this showcase, which may take up the whole of the back wall of the shop,

is left switched on, filling the dark space which would otherwise occur in the middle of the window. Special lighting must still be provided in the window itself and may have to be of a fairly high brightness to avoid the merchandise appearing as dark objects against the lighted interior during working hours; here, too, the use of "foot-lighting" and side-lighting has an obvious application, although one seldom sees it used. These window-lights must be screened from normal view from inside the shop as well as from the street; various methods have been employed, from a simple inner pelmet to an egg-box louvre: a very popular one at the moment is to use deep torpedo-shaped fittings, generally housing reflector spot-lamps, mounted so that their lower rims are at about eye-level: often they illuminate a large showcase which is inserted in the window glass itself, which then becomes in effect merely a glass partition.

Whether or not a backless window is installed the lighting of the interior of the shop is of great importance. Large decorative fittings designed for big stores are seldom effective in the rather cramped surroundings of a small shop, and it is generally better to direct the light on to the walls and counters rather than provide a high level of general illumination over all. Pendant louvred troughs or filament lamps in well-designed housings directing light on the counters can be used with excellent effect. All-glass display counters can often be almost as well lighted by this means as by lamps mounted inside them; the chief advantage being that goods taken out of the counter and placed on top for the customer's inspection are then better lit than they were in the counter itself. Care should be taken to line such fittings up with the front edge of the counter to avoid annoying reflections in the glass top. The wall-space behind the counter is a valuable display area—too often neglected and filled with uninteresting shelves and boxes. Customers waiting for change may be induced to buy goods which they have seen in a lighted showcase or display in this position.

Mention must be made of the newly introduced filament ballast circuit for fluorescent lamps. Since it reduces the capital cost of fluorescent lighting this circuit is likely to find favour in those installations where prime cost weighs more heavily than running expenses in the shopkeepers' mind. It is to be hoped that the mistakes made in the early days of fluorescent lighting will not be repeated as this new technique begins to become popular.

Display Lighting and Modern Store Design

By A. H. OLSEN *
B.Sc., A.C.G.I., A.M.I.E.E.

This article is written following a visit to the United States of America, as the author feels that trends in store lighting in that country will be of interest to lighting engineers, display designers, etc., at home.

The advent of new stores in bombed-out areas, together with the constant post-war rehabilitation that is proceeding, has necessitated the investigation of trends and progress that have been made in other countries, particularly America, where material shortages and building licences have not restricted development.

In both countries, the post-war redistribution of wealth has brought profound changes in retail methods. Departments which were the sole prerogative of the high income groups are now patronised by all. The speciality shop has forced the large departmental store to compete on the same lines with the resultant creation of the shop-within-shop being developed inside the store.

Higher overheads with the increasing cost of labour, materials and rent, have forced the retailer to put as much of his stock on show as possible, to enable the shopper to look

* Courtney, Pope (Electrical) Ltd.

Fig. 1. Interior of Florsheim's shop in Chicago.

around and make his selection before approaching a salesman.

The result of all this is that lighting has had to take an additional burden by making merchandise sell itself to the customer.

Lighting, together with a new emphasis on colour, has been a major factor in design with higher levels of illumination and a colour harmony scheme for the whole store. Walls, interior showcases and all background elements require colours that are cheerful, light reflectant, to set off the merchandise dramatically. Different departments are noted by contrasting colours, each appropriate to the displayed goods.

A new technique in shopfronts is introduced by the open front. Here the merchandise is normally displayed below eye-level in movable cases, the interior of the shop forming the background. Recessed lights in the store ceiling or incorporated in cases give high intensities which are required for displayed goods as well as counteracting glass reflections. A combination of tungsten and fluorescent sources is normally used.

Fig. 1 shows the interior of Florsheim's shop in Chicago, where two open-backed window showcases are shown illuminated by tungsten spots mounted on top of the case. The background, formed by the shop interior, is very attractive, with the tungsten illuminated wall-cases recessed in the red brick wall, which is in turn floodlit by fluorescent strip giving perimeter lighting.

Lighting in picture frames is the general practice for windows in large departmental stores but, in addition, there is a growing tendency to illuminate the back of the window by means of fluorescent lamps recessed in the base or hidden by a pelmet in front of the window enclosure. Normal lighting from the front of the window behind the picture frame is provided by spots with colour filters. Merchandise is displayed to advantage against the low-brightness illuminated background.

A few of the speciality shops have broken away from the open front by having a lobby or miniature arcade with small low case windows with glass tops, the whole creating an illusion of space. Lighting is recessed in the ceiling and, with the aid of high-intensity spots, the cases are illuminated through the glass. This method gives a beautiful effect but, with the load restrictions, it is doubtful if it would be economical for this country.

Once inside the store, lighting continues the sales progress of merchandise. Special high-intensity illuminated displays are necessary to create impulse buying whilst the maximum amount of stock is on display

in illuminated showcases, fixtures, hanging- and wall-cases.

Impulse buying makes sales which form a large proportion of the store turnover, and one of the post-war trends introduced in the States has been for planned lay-outs away from straight-line aisles and rectangular counters with arrangements towards curved line designs known as "free flow planning." Curved pattern in counter lay-outs adheres more closely to the general flow of the traffic. Their irregularity gives designers more scope to lay out feature displays for impulse buying at prominent and unexpected positions. High-intensity tungsten spot-lighting by means of recessed lights in canopies is one method, while another is the use of false ceilings with recessed gimbals or eyeball units. Where colour discrimination or background effects are required, fluorescent lamps are occasionally used for blending the light.

Self-service and self-selection of stock merchandise has produced a wide range of fixtures. Hanging-cases with incorporate fluorescent lighting, wall-cases illuminated with tungsten or fluorescent, open displays normally accentuated by spotlights and counter showcases form the basis of the stock display. Lighting problems arising here are glass reflections in counters, while attempts to eliminate glass from fixtures have produced another headache in dust settlement on merchandise despite the claims of air-conditioning.

There is also the availability of narrow, low-wattage fluorescent lamps for counter-cases, with the advantage of a smaller reflector giving greater visibility of glass area in the counter. An interesting development is the utilisation of the narrow beading in the front of the case, which is used as the lamp reflector.

Wall-cases with a valence have fluorescent lighting incorporated with upward light for the vertical wall surfaces. This acts as perimeter lighting as well as illuminating the merchandise. Coloured interiors suitable to the displayed goods, dramatise the merchandise most effectively in showcases, particularly counters.

A good example of display lighting and colour harmony can be seen in the treatment of crystal glassware, which is shown to best advantage in wall-cases having a slate-blue background. Crystal-ware of smooth contours is placed on a flashed opal glass shelf illuminated from below by means of daylight fluorescent lamps. If sharp contrasting crystal-ware shapes are displayed, it

Fig. 2. Macey's, New York, showing display stands incorporating lighting units.

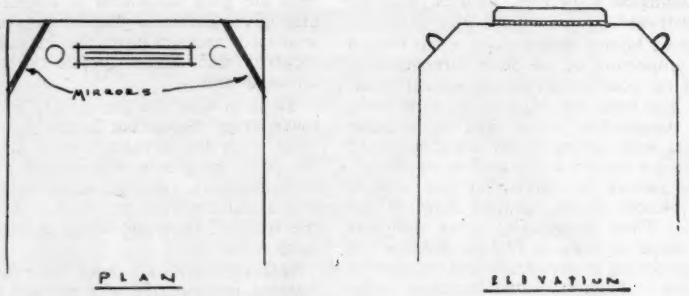


Fig. 3. Plan and elevation showing lighting arrangement in a typical fitting room.

is necessary to illuminate from all sides by means of blended fluorescent and tungsten, hence the combined lighting is from the rear of a miniature picture-frame, the tungsten providing the necessary sparkle and brilliance needed for the sharp contours. Crystal wine-glasses or similar shapes are effectively illuminated by utilising "Perspex" shelves, which are edge-lit with fluorescent tubes arranged at the back of the case with the tube floodlighting the area below the edge-lit shelf.

There is insufficient space in this article to go into the subject of general lighting achieved by various forms of recessed lighting in false or louvrall ceilings or multi-light surface units. Atmosphere is created by use of supplementary lighting and colour by means of cove, perimeter, and other devices to bring brightness contrast to desired levels. Fig. 2, an illustration of a Juvenile Miss Department at Messrs. R. H. Macy, shows stock goods on display in hanging fixtures with self-incorporated fluorescent units. General and supplementary lighting is achieved by a combination of tungsten and fluorescent sources.

In the Fashion Departments, the completion of a sale is carried out in the Fitting Room, and the growing importance of this lighting has made it the subject of much controversy. It has been checked that the majority of customers look first at their faces when they look into a mirror. If the light is too bright, it will not flatter. If colour discrimination is required on the garments, the colour-matching lamps used will not flatter complexions. There is no ready solution to the problem; the only answer is a compromise of all requirements. The sketch (Fig. 3) shows the normal fitting-room with two mirrors placed at an acute angle, the centre mirror being eliminated. Lighting is recessed in a trough placed over flashed opal or translucent glass with two recessed tungsten spotlights on either side of the trough to illuminate the customer below eye level. Flattering colours for complexions are achieved by means of two low fluorescent lamps of 2-ft. size, which are of mixed colours. Garments will have the blending of the tungsten and fluorescent obtained from the spots, together with the overhead fluorescent. This system of lighting would be particularly adaptable for the tungsten lamps being used as ballasts for the fluorescent tubes.

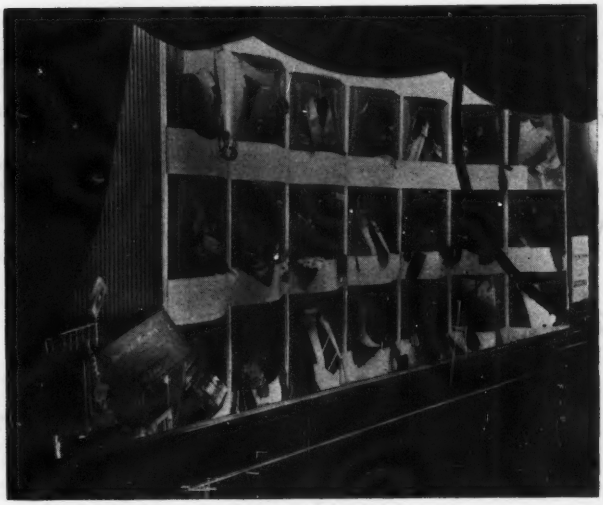
In conclusion, it can be said that store lighting is becoming very highly specialised, and there is a definite need in the industry for the lighting engineer to appreciate store planning problems. Fundamentals of store lighting do not change, but the multi-purpose function of lighting, its relationship to colour, decoration and display makes it a major consideration in the hands of the architect who is constantly seeking greater ingenuity and originality in his designs. The answer to a great proportion of his problems can only be supplied by the store lighting specialist.

Lecture Charts on Electric Lamps

The Edison Swan Electric Co., Ltd., have recently issued an interesting set of lecture charts on the development of electric lamps. Accompanied by a comprehensive set of lecture notes the charts are intended primarily for lectures in schools and technical colleges, but will no doubt find useful application to other audiences.

Copies of the charts and notes may be obtained from the Edison Swan Electric Co., Ltd., 155, Charing Cross-road, London, W.C.2.

Shop Window Display



Simpsons

Illustrated above is a typical example of window display, the good effect of which is helped by suitable lighting. Note the non-reflecting window.

Tècla

This new shopfront combines modern design with "Bond Street tradition." Another view of the shop is shown on p. 44. *Designers and shopfitters were E. Pollard & Co. Ltd.*

A New West End Shop

'Fior'
Burlington Gardens

This shop is an example of the growing tendency to reveal the shop within the window, thus giving a background of movement and added interest and stimulating a desire to enter and examine more closely objects glimpsed within. The interior can be seen and the hesitant are reassured and encouraged to enter.

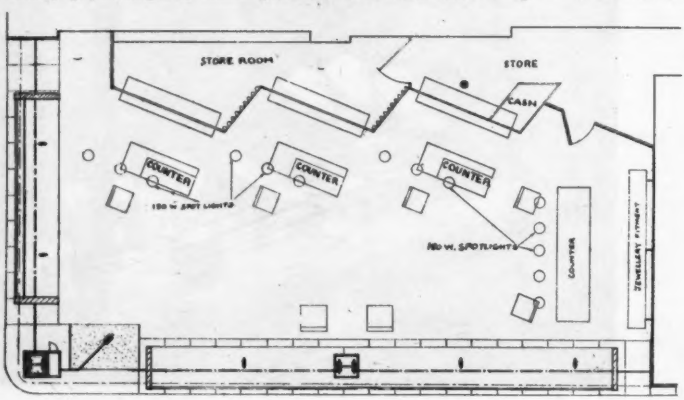
The window display frames give a focal point to which passers-by are drawn; there must be a window through which to look, even if the design necessitates the provision of a "window within a window." The display in these frames also provides a screen, mainly psychological, which protects visitors inside the shop from the curious gaze of passers-by.

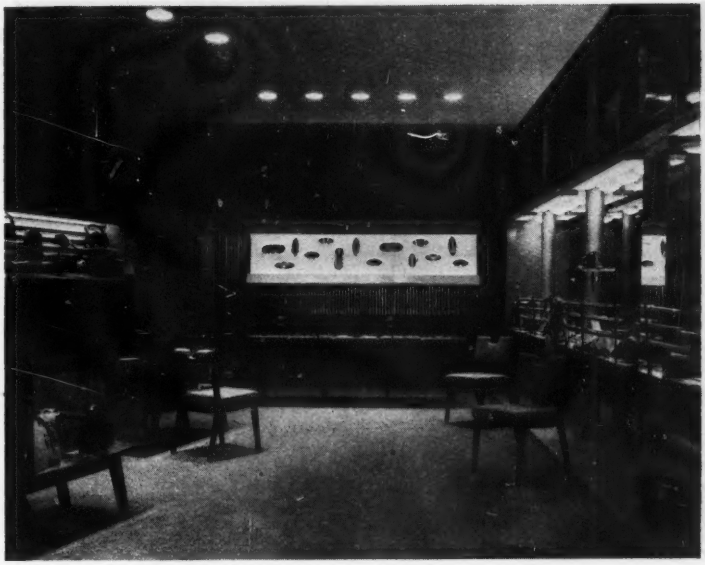
The window display frames are supported on columns placed so that the narrower width is presented to the window to help preserve the all-glass effect.

The interior is spacious and provided with flexible display facilities well suited to the kinds of merchandise handled.

The main interior lighting is provided directly by 13 150-watt internally silvered spot lamps let into the ceiling. Five switches allow variation in the lighting level.

The front window display frame contains 12 fluorescent lamps in 2-ft. and 5-ft. sizes



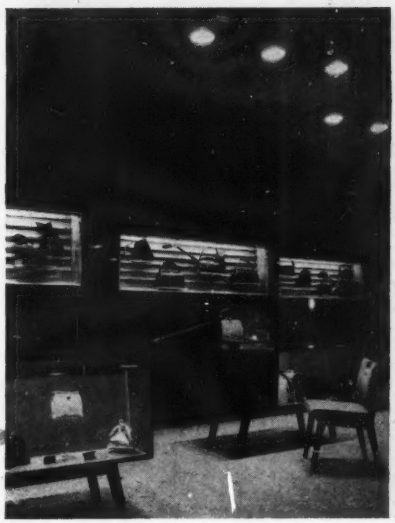


Interior view of the shop looking towards the jewellery fitment.

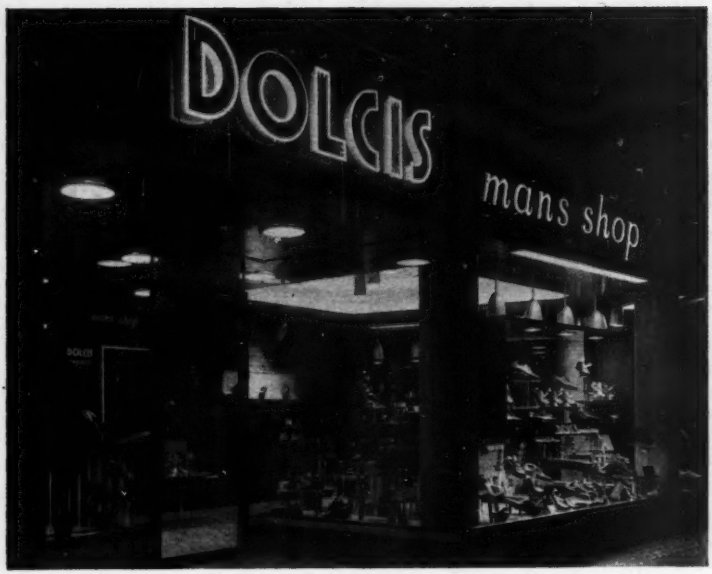
fitted above louvres. Seventeen 100-w. lamps give the added brilliance necessary for the display of jewellery, etc. The Cork-street window display frame is similarly lit with three fluorescent units and eight 100-w. lamps.

The tops of the window display frames are glazed and incline inward so that the fluorescent tubes spread a bluish glow on the pale yellow ceiling which appears to be imperceptibly shaded from blue-grey at the windows to soft yellow at the rear of the shop. Seven switched sockets are provided in the windows for extra display lighting.

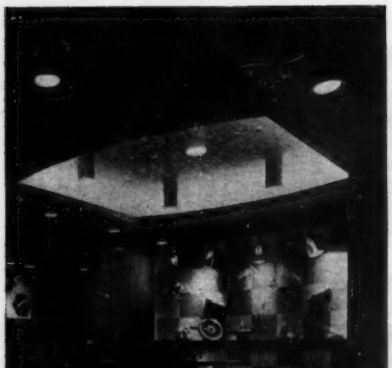
The jewellery display panel on the side wall is formed from sheet metal and floodlit from within the top lip by eight 40-w. incandescent lamps to highlight the jewellery, while three 3-ft. fluorescent tubes behind the lower lip floodlight the background of the panel and give a high level of illumination to the display. Jewellery display pads, brilliant in direct incandescent light, are attached by projecting brackets to the back of the display unit and stand out in high relief against a background of soft fluorescence.



Architects: *Werner Heuman*
Contractors: *E. Pollard & Co., Ltd.*



The entrance from Oxford Street

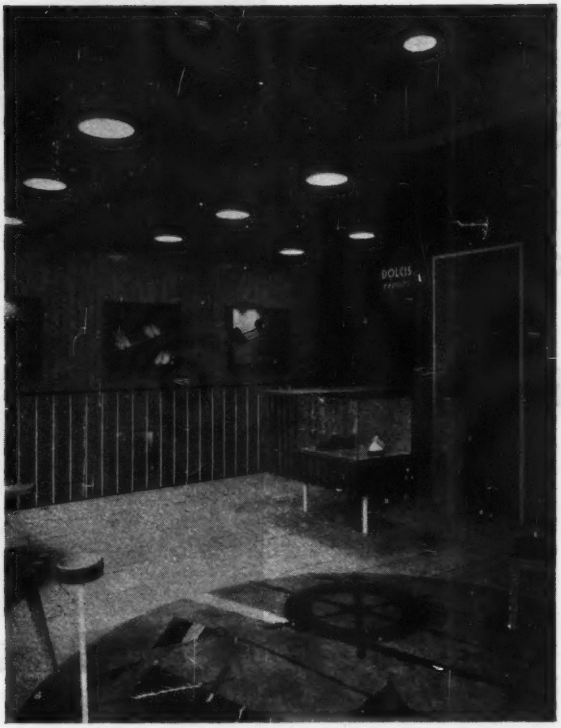


A Man's Shoe Shop

Dolcis, Oxford Street

This shop has been remodelled from an existing property. The ground floor was planned as an impulse sales area while the basement was reserved for the main sales floor. It was important to provide an attractive visual link between the two floors, and the open staircase is given ample visual prominence from the main entrance, and brightly lit stepped showcases attract one down the staircase to the lower level.

Particular care was taken with the lighting of the ground floor to reduce colour distortion to a minimum. The main lighting is by



Part of the ground floor sales area

means of medium white cold cathode tubing concealed in a recessed troffer, the reflecting surfaces of which were painted yellow. In addition, a pattern of "drop tube" fittings with tungsten lamps is installed to blend the light received on the working plane. Levels of illumination in this area are approximately 30 lm/ft^2.

The main display to the shopfront consists of two showcases suspended on special "double skinned" Hyliter fittings and a group of display tables lighted by tungsten and fluorescent lamps incorporated in the bottom of the suspended showcases. The corner window treatment was developed on similar lines, but in this instance a fluorescent trough was recessed into the window soffit and this lighting was supplemented by the use of surface mounted spotlights. In addition, a series of recessed troffers was installed giving a "halo" of light at the window line. The resulting level of illumination in the showcases is approximately 100 lm/ft^2 with approximately 100 lm/ft^2 on the display below.

In contrast to the upper shop, the lighting in the basement is warm in colour. It is provided by a recessed coffer as in the upper shop with recessed spotlights. A certain amount of natural daylight penetrates from the pavement lights into the selling area and is supplemented by cold cathode tubing behind egg-crate louvres.

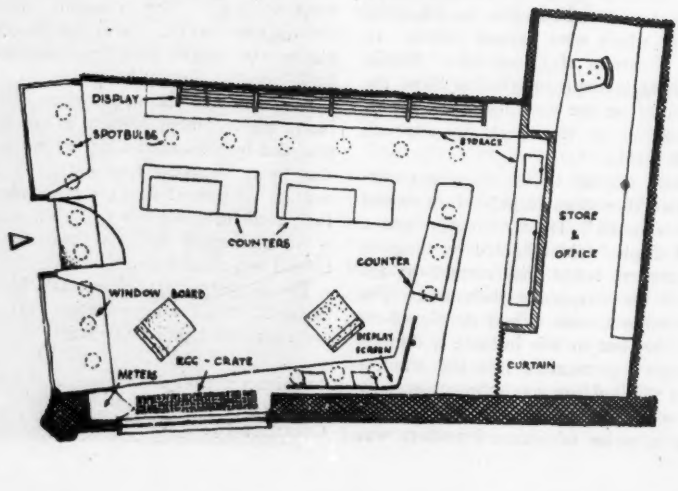
The interesting lighting effects achieved are the result of close co-operation between the architect and lighting specialist.

Architect: *Ellis E. Somake, F.R.I.B.A.*

Electrical Contractors: *Courtney, Pope (Electrical) Ltd.*

Spotlight on Handbags

Susan Shop, Bond Street



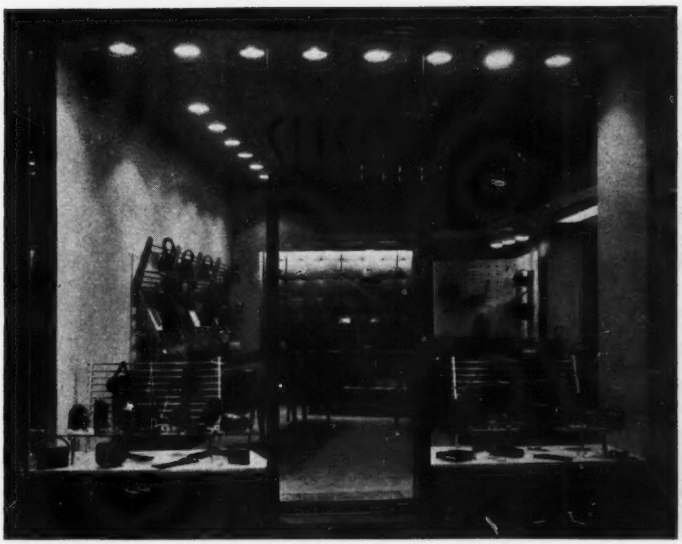
This shop in Bond-street has been designed for the sale of handbags, gloves, and costume jewellery. It makes an excellent example of the open-backed type of shop window which is now becoming popular in this country as a means of overcoming the restriction imposed on lighting for window display. As will be seen from the illustration below, the interior of the shop is clearly seen from the street. This seems to tempt the potential customer to enter the shop for closer inspection of the goods displayed inside.

The front of the shop is lighted by eight 150-watt internally silvered spotlights inset into a false ceiling. They light the goods displayed in the window and silhouette the name over the door, as well as contributing to the general illumination of the shop. Along the left wall there are six spotlights which light the boomerang display and the two counters, each of which have inset display cases. At the rear of the shop two 4-ft. natural fluorescent lamps throw light on the constant display of evening bags and gloves. The counter, which has three 150-watt swivel-type spotlights over it, continues around to the left of the shop, where there are three more adjustable spotlights over the sheet-metal display screen. These focus on particular goods as required. There is a side window to the shop which looks out on a passage and serves for further display. This window has an egg-crate louvre, behind which are two 5-ft. natural fluorescent lamps.

Pastel shades are predominant in the colour scheme, in which the carpets and curtains are grey, the ceiling pale blue and the walls pink and grey. The woodwork is sycamore or zebrano, and the chairs have red upholstery. "Susan" is a convincing example of how lighting can be used successfully as an integral part of the decorative scheme of a shop, and it is obvious that the designer has given considerable thought to its use for display.

Designer: *Werner Heumann*

General Contractors: *Messrs. Hickman (Storefitters) Ltd.*



Showing how the interior of the shop is clearly visible from the street.

Colour Matching Lamps in Display

Jax Stores, Peckham

A view of the showroom looking towards the entrance. Above, a further view, showing the unusual shape of the laylight.

In designing the interior of the new Jax Store in Peckham, the architect has used lighting to give an attractive and dramatic effect.

One of the windows has been lighted with recessed louvred fittings using colour-matching lamps supplemented by recessed spotlights. The other window is made up of a series of stepped showcases and, owing to the design of the window soffits, shallow fluorescent troughs were fitted along the glass line. Supplementary lighting is installed at the rear of the windows in 1-ft. recessed fluorescent troughs; spotlights are also used.

The first impression of the lighting of the interior is the treatment of the left-hand wall, against which are built various wall cases. In front of these fixtures is a serving counter and over this, recessed into the ceiling, is a line of 22 spotlight units each housing a 100-watt pearl lamp in a special anodised aluminium reflector. Above the wall cases, suitably concealed above a ceiling pelmet, is a row of "colour-matching" fluorescent tubes.

Opposite the counter, along the right-hand wall, are various special treatments and to avoid undue brightness contrast there are four wall bracket fittings on the panelled section giving upward light. Adjoining this is a display feature lighted with fluorescent lamps from an overhead louvred fitting and with a spotlight on the base of the feature to help emphasise particular items. The mirror adjoining this display is illuminated by four fluorescent tubes, vertically mounted in pairs behind a bronze metal cove.

The general lighting for this section of the shop, apart from the special features mentioned, is in the form of a large kidney-shaped laylight which is sub-divided into panels and glazed. Above this, fluorescent troughs have been fitted with 5-ft. 80-watt colour-matching fluorescent lamps.

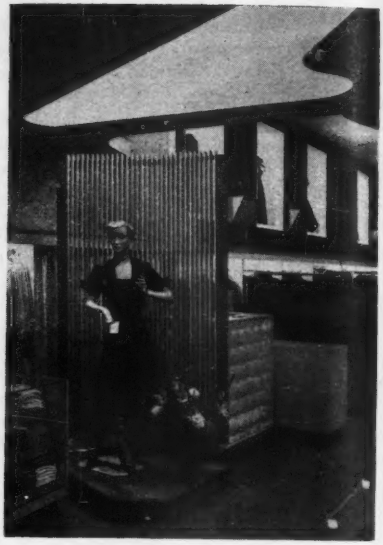
The laylight in the fashion department has 10 circular tungsten fittings with 150-watt pearl lamps suspended below the glass line. This general lighting is supplemented by a row of spotlights with a flexible section on a pendant rod which allows them to be directed on the garments under the fashion canopy, but, at the same time, maintains the line of the fittings.

Architect: *Edmund Reagle, L.R.I.B.A.*

Electrical Contractors: *Courtney, Pope (Electrical) Ltd.*

Showing the window lighting and the entrance to the shop.

Lighting for Interior Display

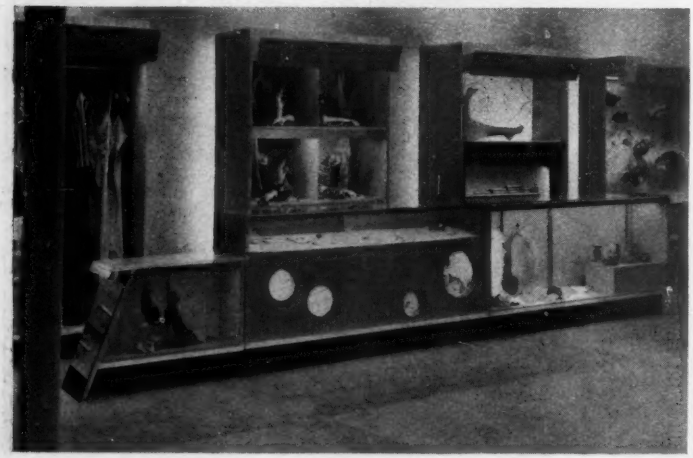


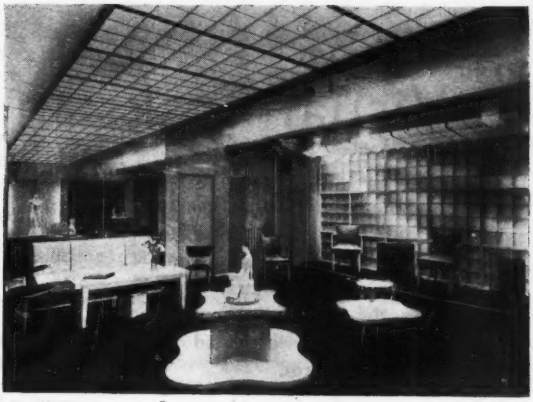
Richards Shop, Liverpool

Bronek Katz and R. Vaughan were the architects responsible for the designing of this new shop where fluorescent lighting has been used most effectively for display as well as for the general illumination. Illustrated above is part of the showroom showing the suspended false ceiling into which has been cut an irregular-shaped opening lighted by means of 5-ft. natural fluorescent lamps. The recessed wall displays are also lighted by fluorescent lamps which are concealed within the frames. Other lighting is provided by spotlights fitted into the false ceiling.

An American Shop

The lighting in this shop, part of which is shown below, creates an atmosphere which is conducive to the selling of goods. Fluorescent and tungsten lamps are used because the combination seems to give a softer effect than fluorescent lamps alone. The wall displays are lighted by concealed fluorescent lamps.





Simpsons (Piccadilly) Ltd.

Supplementary lighting has been introduced as part of the decorative scheme in this recently opened Export Department. The main lighting of the showroom is by five 28*-inch dish-shaped fittings in aluminium, each housing one* 300*-watt lamp. The recessed panel shown in the illustration below is lighted by a continuous line of five* 60*-watt striplights which are concealed along the top of the panel.*

A Birmingham Showroom

Indirect and concealed fluorescent lighting in different colours with concealed spotlights have been combined to produce a striking effect in these new showrooms. The display platform, along one side of the room, is backed by a frame-divided wall of glass bricks. Special lighting for this dais is by daylight fluorescent lamps and 150*-watt spotlights, Stella lamps, in fittings manufactured by Harris and Sheldon Ltd., are used throughout.*

Visual Tasks in Schools

In this, the second article in our series on school lighting, the author deals with the visual demands on scholars and analyses the visual task which they are normally expected to perform.

By H. C. WESTON*

Vision is the main avenue by which the scholar—whether child or adult—usually receives his education, and never were so many "visual aids" to teaching available as at the present time. It is true that vocal teaching is immensely important, but it is not by hearing that those of us who possess a full complement of special senses acquire the bulk of our knowledge. One of the principal reasons for the supremacy of vision in our schooling is that the sense of sight is so comprehensive—it gives us so much information so quickly. Moreover, we are usually more strongly impressed by what we see than by what we hear: as the Roman poet Horace put it, "the things which enter by the ear affect the mind more languidly than such as are submitted to the faithful eyes."

But, the faithfulness of the eyes in "rendering" to the mind the things submitted to them is subject to limits of sensitivity which, however, vary widely according to the luminance of the submitted objects and of the general environment. The eyes cannot "render" the largest black print on the whitest of paper if the illumination is very low. On the other hand, however high may be the illumination of very minute print the eyes are structurally incapable of detecting its detail even when it is viewed as closely as possible.

Evolution of Recommended Illuminations

Although this article is not intended to deal with methods of school lighting, one of the chief objects in evaluating school visual tasks is to secure quantitative data for the purpose of prescribing adequate levels of illumination, and some reference is appropriate here to levels which have been recommended from time to time.

Cohn, whose monograph on the hygiene of the eyes in schools (published in 1882) is a classic in this field, came to the conclusion that school books could be read under an illumination of 50 metre-candles (approx. 5 lm./ft.) as easily as in the fully daylighted classrooms of his time. He therefore recommended that the *minimum* allowable illumination in schoolrooms should be not less than 10 metre-candles. By 1932 the American Standards Association had approved the following recommendations, prepared by the American illuminating Engineering Society and the American Institute of Architects:—

(a) Sewing rooms, drafting rooms, art rooms and rooms where fine detail work is to be done —on the work ..... 8 ft./c.

(b) Class rooms, study halls, libraries, offices, shops, laboratories and all rooms where class work or study is done— on the work ..... 5 ft./c.

These values were increased in 1939 by a factor of x 3, i.e., (a) to 25 ft./c., and (b) to 15 ft./c.

In 1937 the British Illuminating Engineering Society's Recommended Values of Illumination included the following:—

	ft./c.
Art rooms, drawing rooms and sewing rooms	15—25
Laboratories and manual training rooms	8—15
Classrooms, libraries and lecture theatres	5—10

* Group for Research in Occupational Optics, Medical Research Council.

None of the foregoing values was based upon experimentally determined relations between the task characteristics, e.g., size and contrast, and the illumination required for efficient visual performance, but there was a consensus of opinion that they were high enough for the avoidance of eyestrain and for the ready perception of the visual material with which children at school are confronted.

In 1944 the Lighting Committee of the Building Research Board, after considering the latest available data, including actual measurements of the characteristics of the objects commonly involved in school visual tasks and the results of tests of the visual acuity of schoolchildren under different illuminations, recommended that in all the rooms mentioned above there should be a minimum service illumination of 12 foot-candles (12 lm./ft.). Following upon the publication of this Report (Post-War Building Studies, No. 12, H.M.S.O., 1944), the Minister of Education prescribed standards for School Premises (S.R. and O., 1945, No. 345) which include,

"At the working level in teaching rooms, 10 ft./c."

In the 1949 edition of the I.E.S. code values of illumination on the work in schoolrooms are recommended as follows:—

	lm./ft.²
Arts, drawing, and sewing	20
Classrooms and laboratories	15
Lecture theatres	7
Manual training rooms — as required for equivalent industrial processes.	

Thus, since 1937, only the illumination recommended for classrooms has been increased.

Visual Demands in Schools

We may turn now to a consideration of the usage of the eyes in schools and of numerical measures of the most frequent school visual tasks.

For much of the scholar's time in school his attention has to be given to distant displays, consisting of wall charts, words, numerals, and diagrams drawn upon the chalkboard, or of apparatus demonstrated on the teacher's desk or bench. Children whose eyes are emmetropic (i.e., having no refractive error) will not have to draw much upon their power of accommodation even if they are seated in the front row of the class, while children in the back row need not accommodate at all. But, in classrooms of average size, children in the back row will generally be about three times as far away from the displays as those in the front row, and so, for them, the visual, or apparent, size of the objects of attention is only a third of the size as seen from the front row. So it is most important that the actual dimensions of the detail in the objects of attention should be great enough to subtend an angle at the eye of the most distant child substantially larger than one minute of arc, which is the conventional limit for persons of "average normal vision." It should be remembered, also, that the time required for recognising letters and symbols depends on their apparent size and is much longer for some than for others,

Table I

Minimum Sizes of Type for School Books

Age of Reader	Brit. Assoc. Min. height of short letter mm.	Size of type in points	Name of type	I.E.S. Code size	Lines in 1 square cm.	Letters in 1 square cm.
Under 7	3.5	22	2-line Small Pica	Large	1	3
7–8	2.5	16	2-line Brevier	Ordinary	2	8
8–9	2.0	14	English	Ordinary	2	10 (barely)
9–12	1.8	12	Pica	Ordinary	2	10
Over 12	1.58	10	Long Primer	Fairly Small	2	14

as well as being dependent on the age of the observer. Further, we know that this time varies inversely as the brightness and contrast of the objects, so that the size, brightness and contrast of chalk-board or wall displays must all be good if the teacher is to curtail the exposure time sufficiently to cover the ground of a lesson.

In manual training rooms, art rooms and laboratories the child's eyes are, on the whole, used at a moderate distance from the work objects, though in the more advanced classes which do the finer and closer work the scholars have already suffered a small natural contraction of their range of accommodation. Cohn considered that no handwork which must be held closer than 14 inches to the eye should be permitted in schools, but, of course, the occasional and brief inspection of closer objects, e.g., the reading of a vernier, does not strain the eyes of children who, if their eyes are normal, have a maximum accommodative power of about 12 dioptres at the school leaving age.

In ordinary classrooms a good deal of book reading and writing is done and it is in this that the child's eyes can most easily be abused unless school books are printed with type of sufficient size and are well lighted. Various recommendations concerning sizes of type have been made.

Table II

Visual size (averages of measured values) of "critical" detail in common school objects

Task Material	Angle in minutes, subtended at the viewing eye*	I.E.S. Code size	Lines in 1 square centimetre	Letters in 1 square centimetre
Chalkboards				
hand printing	>4	Large		
script (except thickness of lines)	>4	,,		
Wall Charts	>4	,,		
Science Laboratories				
spacing of scale divisions on instruments	>4	,,		
numerals	>4	,,		
thickness of scale lines	3	Ordinary		
Typed matter	2.75	,,	2	8
Log. Tables	1.40	Very small		
Books				
Infants readers	3.8	Large	1.25	4
English grammars	3.0	Ordinary	2	10
poetry	3.0	,,	2	10
classics	2.5	,,	3	17
,,	2.0	Fairly small	3	20
Arithmetic—text	2.75	Ordinary	3	17
examples	2.25	Fairly small	3	21
Mechanics	—	,,	3	21
Greek grammar				
—text	—	,,	3	19
—examples	—	Small	4	29
Bible	—	Fairly small	3	21

* Taken as 20 feet away (i.e., in back row) from the chalkboard, and as 13 inches from books, etc.

Cohn proposed, as a simple test of the suitability of print for school books, that not more than two lines should be visible through an opening of one centimetre square cut in a test card. Later, a Russian regulation stipulated that not more than 15 letters should be visible through an opening of this size. A committee of the British Association, in a Report on the Influence of School Books upon Eyesight issued in 1913, recommended minimum sizes of type and of interlinear space according to the age of the reader. Table I is based on their recommendations.

Recent investigation has shown that these sizes are adhered to fairly well in current school books, but arithmetic and science books make use of 8-point, and sometimes even smaller type, for numerals indicating powers, subscripts, etc. The present article is set in 8-point type.

Size and Contrast Measured in School Tasks.

Measurements of the size and contrast found in the visual objects most frequently attended to in schools were made a few years ago by the writer's colleagues, I. L. H. Moss and E. J. Ward. Some of their findings are given in Table II, together with the corresponding I.E.S. Code grading.

So far as contrast is concerned, it was found that, on the average, the reflection factor of light-coloured chalk writing was about 3.6 times as high as the reflection factor of "blackboards." The difference of reflection factors was about 0.41, which is "Moderate" on the I.E.S. Code scale. The use of relatively dark coloured (e.g., green) chalk on the blackboards was found to degrade the contrast to the extent that the ratio of reflection factors was reduced from 3.6 to 2.14. The difference of reflection factors was about 0.2, which is "Low" on the I.E.S. Code scale. On the average, the contrast between the paper and print in school text-books in service condition was found to be just "High" on the I.E.S. scale, the difference between the paper and print reflection factors being 0.55. The highest reflection factor difference found was 0.77 and the lowest value was 0.46.

No measurements were made of dark chalk on light-coloured chalkboards. Use of the latter has often been recommended in recent years, and it is interesting to note that they were not unknown as much as 100 years ago, when Prof. Koster, of Bonn, regularly used as a chalkboard a painter's canvas sized a dull, dirty white and stretched on a frame. His "chalk" was soft charcoal, which could be rubbed off the "board" with a dry rag, and the board had the advantage of a matt surface. Cohn used a "board" of ground glass.

Using the foregoing size and contrast data, calculation on the basis suggested in the writer's "Proposals for a New Lighting Code" (Trans. I.E.S., Vol. VIII, No. 2, 1943), gives a value for the illumination in classrooms which corresponds with that now recommended in the I.E.S. Code, and quoted earlier in this article.

Defective Classroom Displays

It goes without saying that all objects used in teaching and, therefore, which scholars are required to recognise, should be lighted in such a way as to reveal their characteristic shapes and forms. In the case of solid objects unsuitable lighting may fail to show up features upon which identification depends, so that the child does not know what it is he is shown; or it may give him a misleading presentation so that he "recognises" the object as something other than it really is. These faults are generally due to shadows, or to the lack of them, and to glare caused by the light sources or by the specular nature of the objects exhibited.

But if teaching objects are actually malformed—or illegible, as we say of print or script—all that lighting can do to aid the viewer is to show him all there is to be shown, that is, to "place in his eyes" all available clues to the identity of the objects displayed. Much care has been given to the design of printer's type, and the legibility of the type-faces now commonly used in printing school books is good. However, illegibility can arise from printing on paper of inferior quality, and it is to be hoped that the present shortage of paper will not lead to the use of poor qualities for new school books, which are likely to be in service for several years.

Many years ago Javal pointed out that it is generally fairly easy to read a line of print if the lower half of every letter is cut off, but it is very difficult or impossible to do so if the upper half is obliterated. The reader may easily verify this by covering first the upper and then the lower half of any line on this page. But it is not only in print that the upper half of the letters is more significant than the lower half, for the same is true of manuscript. Hence, in chalkboard writing, the teacher needs especially to form the upper parts of letters correctly to ensure legibility.

Lighting for Bakeries

Lighting forms an important part of the equipment in a bakery. The following describes an actual installation.

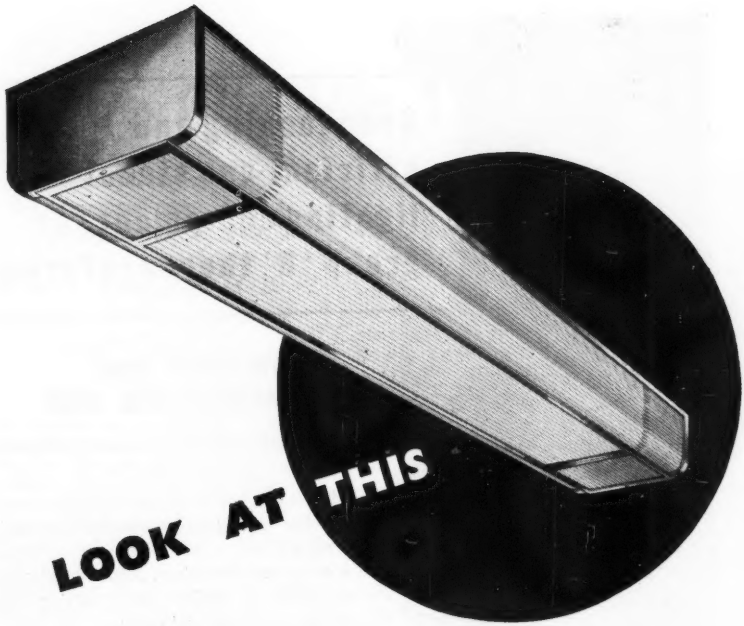
The regular and easy flow of output from a modern bakery is not a matter of chance but of carefully planned layout of machinery and of services, including lighting.

Much of the work is not critical from a visual standpoint, and many operations are automatic and do not require close attention to detail except for initial setting up of machinery and occasional adjustments. But the manual dexterity of the workers does have a marked effect on the rate of output, and is a factor in keeping the floors clear so that the continuous mechanical production does not result in accumulations at any one point and in consequence confusion and a risk of spoilage.

The expertness of workers is enhanced by a clean atmosphere, sense of space for movement and a feeling of safety, all of which come with a well-planned harmonious scheme of interior decoration and lighting. Good lighting also ensures complete cleanliness by showing up any accumulation of dirt in corners or spaces behind machines. In the early hours of the morning, when much of the work is done, men's natural response tends to be slow and ample good quality light coupled with a pleasant interior helps to keep people alert and cheerful.

Suttons' Bakeries, Limited, one of the Allied Bakeries group, fully appreciate the value of good lighting and have recently completely modernised their Coventry bakery, installing additional travelling ovens and fully automatic machinery.

The lighting installation, designed by Crompton, Parkinson, Ltd., and installed by H. P. Mansel Edwards, Electrical Engineer. Coventry, helps to maintain maximum output and adds to the clean and attractive appearance of the entire bakery. Five-foot 80-watt "Daylight" fluorescent tubes in slotted top Crompton vitreous enamelled reflectors are used to provide 10-12 lm/ft^2 in various parts of the bakery.



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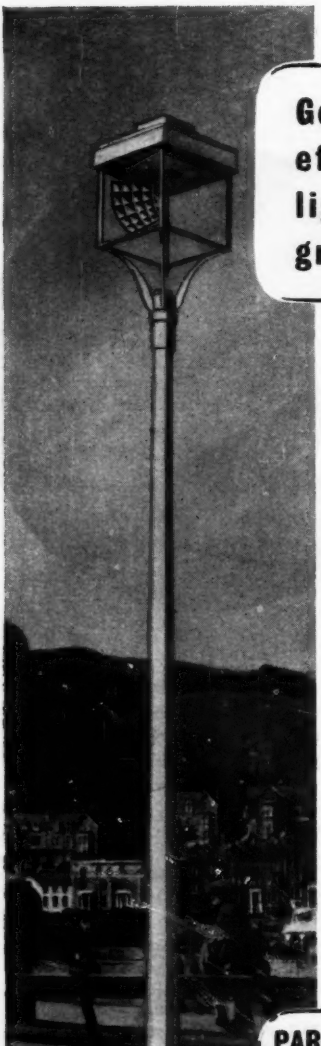

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P.C.L.11

The Old Vic Theatre

The recent reopening of the Old Vic theatre caused much interest. The following article includes a brief history of the theatre as well as a description of the present-day lighting equipment installed there.

London has at last regained its playhouse on the South Bank of the Thames, The Royal Victoria Hall or, as it is affectionately and universally known, The Old Vic. The theatre first opened its doors in 1819 as the Royal Coburg Theatre, being named after Prince Leopold of Saxe-Coburg (afterwards King of the Belgians).

Its builder was a French carpenter named Cabanelle, who was the inventor of a peculiar kind of roof which was called by his name. The foundations of the theatre are extensively composed of the stones of the old Royal Palace of Savoy, which stood in the Strand. In its early days it specialised in melodramas and pantomimes.

The neighbourhood was at this time somewhat dangerous to pedestrians after dark, and after the first season the proprietor announced that it was his intention to have all the roads leading to the theatre well lighted and additional patrols provided for the safety of the patrons.

Many are the famous artists of the Victorian age that have graced its boards. Amongst them were Edmund Kean, Booth, Buckstone, Benjamin Webster and Joe Grimaldi.

On the opening night in 1819, amongst the items on the programme appeared the following:

"A Splendid Harlequinade with new machinery, mechanical changes, tricks and metamorphoses."

In 1833 the name was changed to the Royal Victoria in honour of the Princess who was the heir to the British Throne.

In 1834, Paganini, the great violinist, made his last appearance in this country at a special performance at the theatre. At the time the act drop was a huge mirror, and the theatre was often referred to as the "Looking Glass" theatre. It also numbered amongst its scenic artists Clarkson Stanfield, the great marine painter.

It then experienced a run of misfortune and opened and closed a number of times, the type of performance not being of the first order. Charles Matthews wrote of its audience:

"The lower orders rush there in mobs in shirt sleeves, applaud frantically, consume ginger beer, munch apples, crack nuts, call the actors by their Christian names, and throw orange peel and fruit by way of bouquets."

In 1871 it was renovated and renamed the Royal Victoria Palace, but in 1874 it closed its doors again, and at the auction sale the following appeared in the catalogue:

"It is lighted by 500 Gas Burners, fixed to the roof by a ring of 96 feet in diameter."

It also stated that the seating capacity was 2,800. Afer a very chequered career it was again opened by Miss Emma Cons as the Royal Victoria Coffee Music Hall for the presentation of wholesome Variety and Ballad Concerts. Miss Cons' aim was to provide good and cultural entertainment for the people of South London, a change from the conditions under which they worked and lived.

She was succeeded by her niece, Lilian Baylis, and there then commenced 39 years of marvellous endeavour that was to put the theatre and its company of "His Majesty's Servants" on the very top pinnacle of Thespian Art. Lilian, as she was known and will always be remembered, gradually improved the presentations on more and more cultural lines. Her work and zeal were such that Oxford University conferred on her the Honorary Degree of Bachelor of Arts, and her passing in 1937 was a deep loss to the company and the

South London patrons whom she dearly loved.

During the last war the theatre suffered severe damage in 1941 by enemy action and was closed until November 14, 1950, when it reopened, having been entirely refurnished in its traditional Victorian style under the guidance of the architect, Douglas W. Rowntree, F.R.I.B.A.

To Dame Edith Evans fell the honour of speaking the first lines, a prologue by Christopher Hassall, and we quote some of the lines:—

This is Lilian's day,
From war-time wreck, refresh'd with paint and brick
Rises no Phoenix but the fabl'd Vic,
The new Vic yet the same Vic as of old.
Resplendent in her plush and native gold.

There is little alteration to the auditorium save with the proscenium which has been cleverly designed by the French architect, Pierre Sonrel, D.P.L.G., which gives to the extensive forestage a pleasing surround and introduces the two side doorway entrances to the forestage so beloved of the students of the early English theatre.

As in 1819 it again has its "extensive machinery and mechanical changes," for there is an ingenious oval-shaped lift in its apron stage. The Strand Electric and Engineering Co., Ltd., were entrusted with the stage lighting (as well as the remainder of the electrical work) and there are many modern innovations due to the use of the extensive forestage. The roof of this is provided with a sky dome to provide "cyclorama sky effects" and which also carefully conceals a lighting bridge where are accommodated such things as mirror spots and acting area lanterns to give "down light" to the stage in front of the tableau curtains.

There are no footlights and therefore there are in the auditorium, and carried in special housings under the ceiling of the stalls and circles, both in the centre and at the circle ends, mirror spots and pageant lanterns, the former having remote colour change.

Provision is also made over the side entrance doors at each side of the apron stage for several lanterns which are concealed from the audience by architectural louvres, thus forming a forward type of "Perch."

There are, in all, 60-odd circuits—about half the total of the stage lighting—that can accommodate lighting units in front of the act drop. The stage, back of the act drop, is equipped with the usual spotbar, two magazine battens, a very full cyclorama flood bar and a multiplicity of stage "dips" and fly plugs.

One of the most revolutionary items is the placing of the lighting control desk in the auditorium at the back of the Dress Circle in a glazed observation room, thus enabling the operator to obtain a full view of the stage. The control is the new Strand Electronic System, which has already been described in this journal (December, 1950, page 442). It controls 120 circuits of two kilowatts each and capable of future extension to 144 ways. Amongst the assets of this type of control is the advantage of being able to pre-set the next cue or scene including the pre-setting of the dimmer positions.

The simplicity of this type of control was amply demonstrated as it was only handed over to the resident staff in time to enable them to have two or three days of rehearsal before the opening. The producer had devised many elaborate changes and lighting cues, and great credit must be given to the operator who so quickly familiarised himself with the new type of control with such effective results.

Physical Society Exhibition, 1951

The Physical Society's thirty-fifth annual exhibition of scientific instruments and apparatus will be held from Friday, April 6, to Wednesday, April 11, 1951, excluding Sunday.

This year both the Royal College of Science Main Building, Imperial Institute Road, and the Huxley Building, Exhibition Road (opposite Science Museum), will be used. On Friday morning the exhibition will be open for members of the Society only.

This exhibition takes place before the opening of the Festival of Britain, but physicists from abroad who intend to visit the latter may like to make arrangements to come to England earlier as the exhibition affords one of the most important displays of scientific achievement which is held in Great Britain, and is unique in showing side by side the work of academic scientists, commercial instrument makers and research workers in Government and other laboratories. It will also provide a convenient opportunity for conversations and contacts with technical representatives of British firms and associations. Discourses will be delivered by eminent scientists on four days of the exhibition.

A handbook of the exhibition, containing full descriptions of all exhibits, will be obtainable from the Physical Society in early March.

I.E.S. ACTIVITIES

London

At the London sessional meeting on January 9 a paper on "Brightness Engineering" was presented by Mr. W. Robinson. Although much has been heard of this subject during recent years and considerable attention has been given to it in other countries this is the first occasion on which a paper on the subject has been presented in this country. The paper is a review of present knowledge of the subject and the author makes no claim to putting forward any original ideas. He is to be congratulated, however, on tackling such a difficult subject, and the paper, when published in the I.E.S. Transactions, will no doubt be carefully studied by lighting engineers in this country who are anxious to know more on this topic. The discussion of the paper was also of great interest and value.

The paper outlines the progress made in the study of the brightness relations necessary for ease and comfort of seeing. Brightness engineering is a term coined to embrace the application of the results of this work to lighting practice, and its prospects of successful adoption depend on the acceptance of agreed brightness criteria and on the existence of adequate brightness design data and suitable instruments for brightness measurements in interiors.

It is generally agreed that the control of all interior brightness ratios in relation to the work and source brightnesses is essential for sustained, comfortable vision and there is a growing tendency to use a 3:1 ratio as a guide. The paper discusses the experimental background of this ratio and suggests that the time is ripe for an investigation into the establishment of a general brightness code. The author suggests that this investigation would be assisted by adopting a provisional code, such as the 3:1 ratio, as a basis for reference.

Brightness design data is now available in the form of interreflection tables which enable the average brightness of floor, walls and ceilings to be predetermined in a manner similar to the predetermination of illumination from coefficient of utilisation tables. These tables are based on the use of a "Room Coefficient" which, as with the lumen design "Room Index," is a simple function of the room dimensions. All interiors, regardless of size or dimensions, which have the same value of room coefficient have the same interreflection characteristics, and it has therefore been possible to provide comprehensive interreflection data covering a very wide range of interior sizes and shapes in a compact set of tables. The brightnesses in foot-lamberts of the various room surfaces are given by appropriate tables as a proportion of the average horizontal room illumination, and their predetermination resolves itself into a simple additional step in the normal illumination design process.

A brief description is given of the field flux method of lighting design, in which emphasis is placed on the zonal distribution of light flux rather than on brightness ratios. The criterion adopted is based on natural lighting conditions out of doors, which have been judged from observations to be most acceptable to human beings. These optimum visual conditions are measured by a special instrument and are transferred to a flux chart which is used as a basis for interior lighting design. By use of interreflection tables and special design methods, interior lighting is made to reproduce, as far as possible, these optimum visual conditions.

The paper also reviews the facilities available for the routine measurement of brightness; though the methods of brightness measurement now available are technically adequate for the purpose of brightness engineering, cheaper and more compact instruments would no doubt be developed as brightness engineering gained ground.

Manchester Centre

The annual luncheon of the Manchester Centre was held at the Midland Hotel, Manchester on December 14. In spite of the fog and snow which descended on Manchester that day, the majority of members of the Centre supported the function, which was most successful.

The principal guest was Mr. H. Prince Bardsley, President of the Manchester Chamber of Commerce, who, in proposing the toast of the I.E.S., spoke of the need for collaboration between the producers and users of light. As a user himself, he felt that there was still room for improvement in the use of fluorescent lamps, not the least defect in which was the annoying flicker which, in spite of twin-tube circuits, was still so preva-

At the Manchester Centre's Annual Luncheon: *(Left to right)* Dr. Lipson, of the Manchester College of Technology, H. Prince Bardsley, President of Manchester Chamber of Commerce, W. G. Chilvers, Chairman of the Centre, L. J. Davies, President of the Society and J. Martin, Vice-Chairman of the Centre.

lent. Street lighting was another field of lighting which most urgently demanded co-ordination. He paid tribute to the work of the President, Mr. L. J. Davies, and his colleagues in the fields of light sources and lighting applications, and expressed the hope that they would continue their efforts to deal with the work still to be done.

Mr. Davies, in reply, said how much the industry appreciated such comments as those made by Mr. Bardsley. The industry was aware that much work was still to be done, and welcomed suggestions from outside the industry. He said it was difficult to define an illuminating engineer, as his interests were so wide; it was equally difficult to define the Illuminating Engineering Society, as its members included representatives of many professions in addition to the lighting engineer. It was for this reason that the Society was able to study and discuss the many requirements of users of lighting and welcomed their views.

The toast of "The Guests" was proposed by Mr. J. Martin, vice-chairman of the Centre, and the response was made by Mr. T. D. Woods, chairman of the Liverpool Centre.

Forthcoming Meetings

LONDON

1951

February 13th
Sessional Meeting. "The Extension of the Gas Arc Condition," by H. W. Cumming. (At the Lighting Service Bureau, 2, Savoy Hill, W.C.2.) 6 p.m.

February 28th
Informal Meeting. Discussion—"Assessment of Lighting: Instruments or Instinct." (At the Lighting Service Bureau, 2, Savoy Hill, W.C.2.) 6 p.m.

CENTRES AND GROUPS

1951

February 1st
Presidential Address, by L. J. Davies. (At the South Wales Electricity Board, Demonstration Theatre, The Hayes, Cardiff.) 5.45 p.m.

February 5th
"Analysis of Lighting Problems in an Industrial Undertaking," by F. G. Copland. (Joint Meeting with the Electrical Contractors Association.) (At the Lighting Service Bureau, 24, Aire Street, Leeds, 1.) 7 p.m.

February 5th
Presidential Address, by L. J. Davies. (At the Medical Library, The University, Weston Bank, Sheffield, 10.) 6 p.m.

February 9th
"Lighting for the Prevention of Industrial Accidents," by E. W. Murray. (At the Imperial Hotel, Temple Street, Birmingham.) 6 p.m.

February 9th
"Floodlighting," by R. O. Ackerley. (At the Demonstration Theatre, East Midlands Electricity Board, Leicester Sub-Area, Charles Street, Leicester.) 6.30 p.m.

February 15th
"Sodium Lamps and their Application," by A. W. Gostt. (At the Cadena Cafe, Eastgate Street, Gloucester.) 6.30 p.m.

February 15th
"Street Lighting," by W. R. Stevens. (At the Gas Showrooms, Parliament Street, Nottingham.) 5.30 p.m.

February 20th
"The Operation and Maintenance of Fluorescent Lighting Installations," by G. D. Jones-Thomas and W. A. Stoyle. (At the Lecture Theatre, Merseyside and North Wales Electricity Board's Service Centre, Whitechapel, Liverpool, 1.) 6 p.m.

February 21st
Details to be announced. (At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.)

February 22nd
"Sight and Light," by J. Benson. (At the Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford.) 7.30 p.m.

REVIEW OF BOOKS

"Some Investigations on the Illumination of Photographic Darkrooms," by Prof. G. Weber (President of the Danish Illuminating Engineering Society). The Academy of Technical Sciences and the Institution of Danish Civil Engineers. Trans. V. Bonde.

There is a very great deal more in this book than its title would suggest. Prof. Weber has produced a very thorough exposition of the whole of the photographic process which determines the nature of darkroom illumination. He describes from first principles the determination of the spectral sensitivity of the photographic material and, in the course of this part of his work, finds time to discuss in detail the problems of density measurement by visual and photographic means.

There follows an equally detailed treatment of the visual characteristics which apply at low levels of brightness. This section is of especial value, because Prof. Weber shows an intimate knowledge of much published material which is not widely familiar in this country.

Finally, he brings all this theoretical matter together to demonstrate how it can be applied to the problem of darkroom lighting — how the maximum amount of illumination which can be employed with any given photographic material can be determined. Types of lighting fitting are discussed, and the general layout of a good darkroom demonstrated.

The consultant who wishes to be thoroughly versed in the subject of darkroom illumination will find Prof. Weber's book a useful compilation of the information which he needs to have. It does not claim to make an original contribution to the subject, but serves as a reference book as well as a guide to design problems. The list of references suggests that little modern work has been consulted, but the text shows no lack of knowledge of recent work. It is, of course, always necessary to supplement text book reading with a study of recent literature, but with a textbook which gives a good grounding, the search of the literature is made more easily.

Prof. Weber expresses the hope that his work will "serve as a contribution—however humble—towards an improvement of the conditions of those who spend . . . their working hours in a gloomy photographic darkroom." One can only hope with him that it will. The reviewer recalls his reactions to his first experience of the lighting in the darkroom of a leading commercial photographer, whose work was, and is still, right at the top of the top grade. Even such a firm was content to tolerate dark walls, restricted local lighting of very limited amount, and an atmosphere of extreme gloom. It may well be that the staff preferred it that way—craftsmen are known to be the most conservative of men —but they should be given the opportunity of experiencing good lighting conditions such as Prof. Weber describes before they choose to go back to their black holes—if indeed they ever would. R. G. H.

"Photometry and the Eye," by W. D. Wright, A.R.C.S., D.Sc. Hatton Press, Ltd., 1949. Price 7s. 6d. Pp. 127 *and* ix, 30 *diagrams.*

This little book is based on the short course of lectures given by Dr. Wright at the Imperial College of Science in the summer of 1948, and its title closely indicates its scope. The author sets out to sketch precisely and concisely the fundamental principles and procedures of photometry and colorimetry in silhouette—as it were—against the much more complex picture of the behaviour of the eye drawn by eminent research workers, himself included. The result is a very clear delineation of the proper limitations of photometry as a particular aspect of radiometry, of the present state of knowledge concerning the eye, and of the subtle misconceptions which can arise from any confusing of the objective with the subjective sides of the picture. Not so long ago the slogan was "beware the photocell." Now it would seem to be "never believe what you see." That, however, is exactly the over-simplification which Dr. Wright seeks to combat. He is at pains to expose and define the physical basis of any proposed system of measurement, whether the eye or the photocell be used, and then to examine to what extent, or within what limits, the results may be regarded as a measure of the subjective visual sensation in question. The difficulties which may arise in trying to devise a physical scale which matches the sensation scale over a useful range of possible variables are well brought out in the discussion of flash measurements at the end of the book.

Dr. Wright is known for his single-eyed pursuit of logical argument and precise definition, with a good seasoning of controversy. We meet this trait in Chapter I, where his treatment of the geometric principles involved in photometry, done without any use at all of the ordinary concept of the intensity of a light source, will strike some readers as most unorthodox and provocative.

The book is stimulating and well worth perusal by expert or novice. There seem to be no errors of consequence, though on p. 118, where flash-point (!) is reached, there occurs a sentence whose meaning is in part the reverse of what was intended. As a summary of the information which should be at hand to any but the purely routine worker in photometry or colorimetry the book is excellent. J. S. P.

POSTSCRIPT

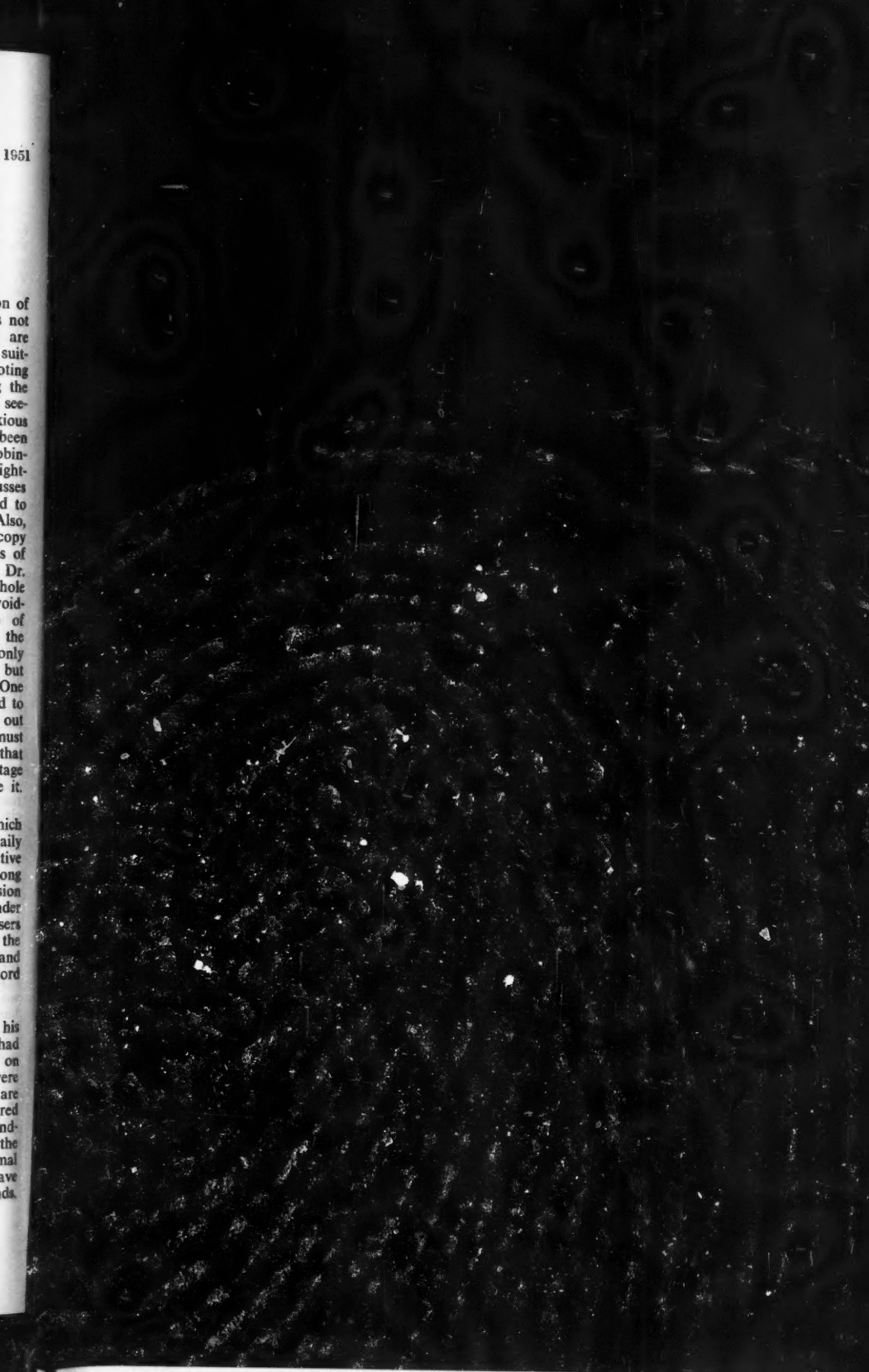
By "Lumeritas"

According to a schoolmaster correspondent, economy in connection with school buildings appears to have been carried too far in the new Infants Department of a school near London. Apparently it was decided to install no artificial lighting for teaching purposes, on the ground that lessons finished so early in the afternoon that they could always be conducted in daylight. No one seems to have remembered that there is quite a number of very dull days in the winter months when artificial lighting is necessary even in morning school hours, but, as a concession to the school cleaners, it was eventually decided to install one small light source in each room.

Recently, I came across a paragraph in a daily paper reporting the high price (hundreds of pounds) paid by a stamp collector for a partly imperforate sheet of stamps. I could not help wondering that a manufacturing fault of this kind—comparatively rare though it may be—should so greatly enhance the value of a few stamps of low face value; nor could I help wishing that other faulty articles were so highly valued, for I had just purchased a 60-watt lamp of well-known make and discovered, on unboxing it, that one of the cap pins was missing. Are there any lamp collectors who would prize this unusual and unused specimen? If so, I am willing to dispose of it to the highest bidder!

A correspondent asks, "should not the street-lighting authority he held responsible for many accidents? Take a night trip in a car from Marble Arch to Ealing Broadway and see the terrible lighting on many parts of the road. Poor lighting in Hyde Park is a disgrace to a modern city. Many traffic islands are frequently damaged because they are so difficult to see." I am not familiar with the route referred to, but there are other much frequented routes in the London area on which there are stretches I would describe as terribly lighted. It is not merely that the lighting is inadequate, but that it is actually confusing and, from the motorist's point of view, worse than no lighting at all.

The correspondence upon "quality and quantity" in lighting which I suggested, last July, might be evoked by the publication of a letter from Mr. G. P. Wakefield, has not materialised. If, as i believed, there are different schools of thought as to the suitability of the term "quality" for denoting all "the factors [in lighting], excluding the *amount* of light, that promote efficient seeing," their protagonists do not seem anxious to do battle in public. The subject has been brought to mind again by Mr. W. Robinson's recent paper to the I.E.S. upon "Brightness Engineering" in which he discusses some American design methods intended to improve the "quality" of lighting. Also, I have just received, from Australia, a copy of a review by Dr. Dresler of Methods of Appraising the Quality of Lighting. Dr. Dresler states that "almost the whole problem of lighting quality" is that of avoiding glares by reducing the difference of luminance between the luminaires and the other parts of the visual field by "not only decreasing the luminance of the former, but also raising the brightness of the later." One American method Dr. Dresler is tempted to regard as "something merely created out of pure delight in systematising." I must confess that to my simple mind it seems that the design of lighting cannot with advantage be so systematised as some would have it.

Regarding the Festival of Britain, which will soon be upon us, a writer to the daily Press urges the renovation of the attractive but not modernistic lamp standards along the Thames Embankment, and the inclusion in the lanterns of coloured lamps. I wonder if this idea has occurred to the organisers of the Festival. I wonder, too, what the lighting of the Exhibition itself is to be and trust it will not compete in—to coin a word—the "bizarity" of the buildings!

Before the Minister of Fuel imposed his ban on the lighting of shop windows, I had noticed for several weeks a certain shop on my homeward route in which candles were in use. Neither candles nor foot-candles are now allowed unless the latter are procured by the use of electricity generated by windmills. Candles are banned to prevent the rapid exhaustion of supplies by an abnormal demand, but the fear of fire might well have kept the demand within manageable bounds.